

Analyzing Supplier Selection with Lean Philosophy: A Review

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Abstract:-With increasing global competitive pressure the organizations are searching better suppliers for their effective manufacturing so that they can produce and deliver best product to their customers with less price and higher quality. For this reason the concept of lean manufacturing originates from automobile industry to increase the efficiency and to reduce the wastage in production so that manufacturing cost will also decrease. That's why lean companies selecting their suppliers with considering lean principles. The objective of this research is to understand the change in the requirements of customers in global competitive market with the adoption of lean philosophy. Lean improves the efficiency and relationship with the suppliers for long term business.

Keywords: Customer Supplier relationship, Supplier Selection, Lean Manufacturing, Automotive industry.

1. Introduction:

Due to globalisation and competitiveness between firms, the companies are trying to establish close and collaborative relationship with their supplier. So for effective competitiveness supplier selection process become for critical for the Original equipment manufacturers. A suitable steps and selection process are changing from organization to organization depending upon their need and requirement of the customer.

Automotive OEMs has so many suppliers in their supply chain because thousand of components and parts are to be procured for making assembly of one product, this make automotive industry more crucial than any other industry in the selection of supplier in their supply chain.

The aim of this research work is to study the supplier selection criteria and their selection process which influences the quality and productivity of the OEMs. Also with lean principles how suppliers help to their parent organization to be in competitive.

2. Literature Review:

According to **Choy et al. (2004)**, there have been several changes in the business environment like increase in international competition, technological improvements, improvements in customer knowledge and needs. These changes create a challenging environment for companies. Companies have to find better ways to increase their total performance of businesses or even to stay in the market.

Deshmukh & Choy et al. (2004) call this type of relationship as inter-enterprise relationship. This collaborative and closer relationship provides improved business processes in the whole supply chain.

Lambert & Schwieterman (2012), Relationship with suppliers affects the overall performance of a company; therefore, type and level of relationship are critical factors for customers. A relationship must create value for both parties by achieving best possible financial performance.

Kannan & Tan (2006), they have been present various methods to categorize relationship types between clients and suppliers. The most popular categorization types for relationships are strength, closeness and physical proximity.

Booth (2010) also describes the supplier relationships by means of their strategy type. He offers three strategy types, these are called deliver, align and collaborate. First, in the deliver type, relationship is limited to delivery and payment. Second, align relationship includes some transparency and alignment. Finally, in a collaborate type of relationship, both parties benefit from the relationship. This is achieved by a closer relationship and sharing critical goods and services.

Ravindran & Wadhwa 2009; González et al. (2004), stated that supplier selection is a critical decision in supply chain activities; because, suppliers play an important role for performance of a company. Final product quality and total productivity highly depend on supplied products and services. Therefore, it can be said that all suppliers in a chain contribute to the performance of the final product that is sold to consumers.

According to **Monczka et al. (2009)**, effective selection of suppliers provides firms to improve profitability and enhance customer satisfaction from four ways: (1) competitive pricing, (2) delivery service, (3) product quality and (4) product variety.

Monczka et al. (2009), determined that company may need a new supplier because of several reasons like new product development, insufficient supplier, end of a supplier contract, buying new machinery or expanding to new markets.

According to **Masella et al. (2000)** Long-term and close relationships require more effort and investment; however, they have many benefits to both customer and supplier in the long run.

Tracey & Tan (2001), Effective selection of criteria helps firms to determine suppliers which can provide competitive pricing, better delivery service, better product quality and variety.

Lee et al. (2001) stated that every criterion has different level of importance for customer. A good way to understand the value of each criterion is assigning weights to each of them. Therefore, after defining criteria, fourth step is determining weights. Then, suppliers can be evaluated and weights for each supplier can be calculated.

Kahraman et al. (2003), expressed that criteria make elimination process possible by helping determination of whether a supplier conforms with strategy of an organization or not. Criteria can measure suppliers in terms of their financial strength, management approach, capability, technical ability, resources and quality systems.

According to **Karanjkar (2007)**, Toyota achieved to apply lean practices in production with variety of products. The system also allowed low cost, high quality and high performance.

Bayou and Korvin (2008) define lean as dynamic, long-term and integrative concept. Lean is superior to mass production; because, lean uses less than mass production in terms of human effort, manufacturing space, investment in tools and inventory; and results in fewer faults and produce more variety of products.

Hines & Taylor 2000; Howell (2010), stated that defective parts are also considered as waste since they have no value. They cause rework, delays, more production cost, errors in paperwork, quality problems, poor delivery performance and decrease productivity.

3. Motivation:

To survive and sustain in competitive position in their respective markets a qualified supplier is a key element and a good resource for a buyer in reducing such costs and increasing quality of the product. It has become an important component of supply chain management to development an effective and rational supplier selection model which is naturally desirable.

The purpose of supplier evaluation is to ensure a portfolio of best in class suppliers is available for use to satisfy the need of the customer. It is also a process applied to current suppliers in order to measure and monitor their performance

for the purposes of reducing costs, mitigating risk and driving continuous improvement.

Unfortunately, most of their models do not provide a mechanism for efficient analysis of a large set of suppliers. If the number of suppliers and criteria increase, the problem of evaluation becomes more difficult and needs more time to be resolved. So, we propose to develop a comprehensive and efficient model to analyze this type of problem for tracking or monitoring the quality performance of suppliers.

4. Objectives and Scope:

The objective of this work is to increase the understanding on which factors have influence on supplier selection process of organizations and how lean ideas have improved and changed the decision of suppliers. Automotive industry is selected as a project area and the following questions are formulated.

Comprehensive questions for this work:

- Is it possible to determine the important criteria for supplier selection?
- Which factors have an influence on supplier selection criteria of organizations?

Questions related to lean production:

- Does lean philosophy influence supply chains? In what way?
- How lean philosophy influences the supplier selection criteria of organizations?

Final research questions about automotive industry:

- What are the important criteria for selection of suppliers in automotive industry?
- What is the effect of lean philosophy while selecting suppliers in automotive industry?

5. Methodology:

Research is gaining new knowledge and finding solutions to problems by a methodical and systematic approach [13], [1]. Research methodology shows the approach and technique of the research and describes the way research is conducted [13].

Surveys ask questions to various people to collect information. Historical data are useful looking for patterns. On the other hand, case studies and action researches are classified as qualitative research methods. Case studies are observations in real world in order to understand the phenomenon in its natural environment. Action researches apply the idea into practice and researcher can change the results by his actions [17].

In this research paper data are collected and analysed to come finally on conclusion. Various modes of data collection used are as:

- Questionnaires and surveys
- Interviews
- Observation

5.1. Supplier- Customer relationship:

Collaboration with the supplier is important to understand the needs as well as to gain a thrust in long term relationship. According to [3], relationship with suppliers affects the overall performance of a company; therefore, type and level of relationship are critical factors for customers. A relationship must create value for both parties by achieving best possible financial performance.

The most popular categorization types for relationships are strength, closeness and physical proximity [11]. [3] Describes different relationships by flow of information between each business. He explains two types of relationship which are bow-tie relationship and diamond relationship. If there is a restricted access to information and limited number of contacts between customer and supplier, the relationship is called bow-tie relationship. On the other hand, if there is an informed access and many contacts between them, it is called diamond relationship. [3] Bow tie relationship can be seen in Figure 1.

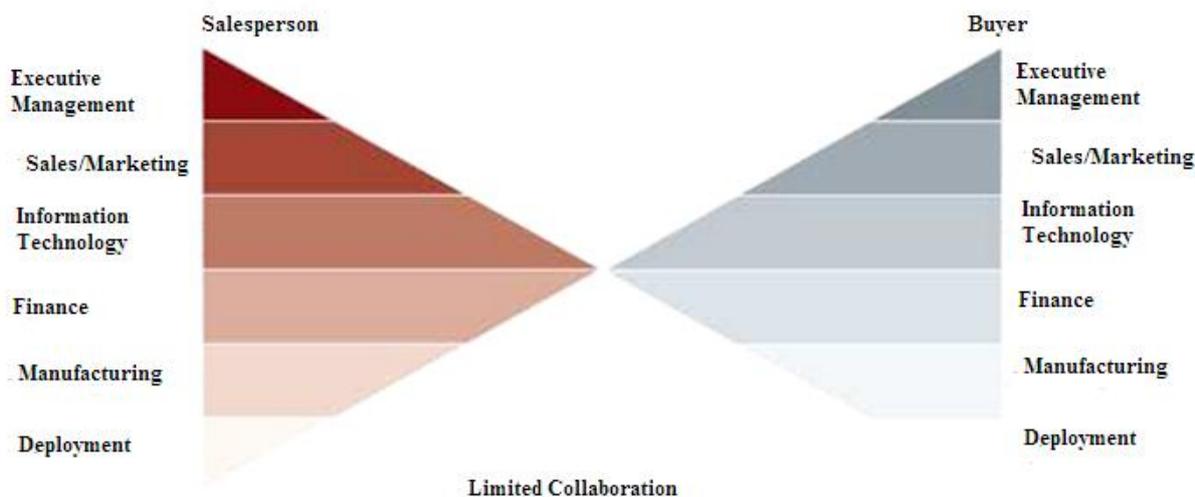


Figure 1. Bow tie relationship [20]

5.2. Supplier Selection process:

Because of globalization competitive business environment force companies to enhance their quality and services while reducing costs and satisfying the need of the customer. Therefore, companies take into account every factor that they can reduce costs and improve productivity. Since procurement is one of the most critical activities in supply chain management, supplier selection is important for organizations to improve their performance. Doing business with appropriate suppliers provides many advantages to firms in the long run.

Steps of supplier selection process: Refer figure 2 for supplier selection process steps

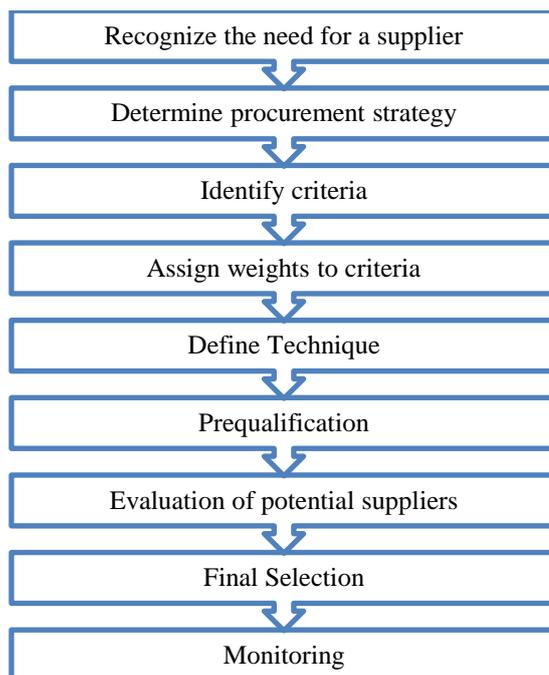


Figure 2. Steps of Supplier selection process [16]

5.3. Fundamentals of Supplier Selection Criteria:

The aim is to understand the criteria that are used today for supplier selection. To do this, the evolution of criteria is described from past to expected future. Also, criteria selection for different industries, countries and company

types are mentioned in order to figure out how to choose proper criteria for supplier selection. Criteria are changing with different level of integration.

Following table 1 shows criteria with different level of integration presented by [8].

Table 1. Criteria with different level of integration [8]

Level of integration	Definition	Criteria
Level 1	No integration	Price, Quality
Level 2	Logistic integration	Price, Quality + Reliability, Flexibility, Lots, Lead time
Level 3	Operational integration	Price, Quality, Reliability, Flexibility, Lots, Lead time + Process capability, High flexibility, JIT
Level 4	Integration in process and products	Price, Quality, Reliability, Flexibility, Lots, Lead time, Process capability, high flexibility, JIT + Human resource, design involvement, Management ability, Culture
Level 5	Business partnership	Price, Quality, Reliability, Flexibility, Lots, Lead time, Process capability, High flexibility, JIT, Human Resource, Design involvement, Management ability, Culture + Best supplier in human resource and technology

5.4. Lean Manufacturing:

Lean production was introduced to world with the book Machine that Changed the World [25]. The book was the first book about lean and it describes the principles of Toyota production system. With the help of the book lean principles started to be adopted by Western manufacturers [9]. First adoption of lean was limited with few processes. These are shop floor techniques of lean, small batch production, standardized work and Kanban. However, first lean adopters hardly sustained lean principles [10]. They could not apply lean principles in their culture and mind-set and many lean attempts were not completely efficient.

In 1996, Womack and Jones defined five principles of lean thinking as a guide. These five principles were:

- 1) Identification of customer value
- 2) The management of the value stream
- 3) Developing the capability of flow production
- 4) The use of pull mechanism to support flow of materials
- 5) The pursuit of perfection through reducing all forms of waste in production system

5.4.1. Characteristics of lean:

As time passes lean manufacturing indicators and expectations are also increased by the lean companies.

The most common lean characteristics are the followings:

- Elimination of zero-value activities [9], [10]
- Continuous improvement [22]

- JIT production and delivery [22], [26]
- Pull instead of push (closely related to JIT) [22], [26]
- Multi-functional teams [22]
- Integrated functions (closely related to multi-functional teams) [22]
- Flexible information systems [22]
- Zero defects (related to JIT and multi-functional teams) [22]
- Supplier integration [22]

[22] There are seven wastes that must be eliminated for lean production, these are:

- 1) Over production
- 2) Defective parts
- 3) Inventory
- 4) Inappropriate processing
- 5) Transportation
- 6) Waiting
- 7) Unnecessary motion

5.4.2. Effects of lean supply on supplier production:

Lean production is another activity for relationship with supplier. It improves productivity and brings performance in benefits to both parties. Productivity start with elimination of all kind of waste and non value added activities in the process. Also help to keep minimum inventory which help to cost reduction in supply processes. This can be achieved

by suppliers which can provide JIT production [26]. Since JIT production requires pull system, all supply chain must be pull instead of push.

5.5. Supplying in the automotive industry:

In automotive industry the supply system is more functionally segmented. Figure 3 shows the supplier segments as raw materials suppliers, component specialists, standardisers’ and integrators. Each of the suppliers has its own capabilities in the chain [6].

	Raw material supplier	Component specialist	Standardiser	Integrator
<i>Focus</i>	A company that supplies raw materials to the OEM or their suppliers	A company that designs and manufactures a component tailored to a platform or vehicle	A company that sets the standard on a global basis for a specific component or system	A company that designs and assembles a whole module or system for a car
<i>Market presence</i>	<ul style="list-style-type: none"> • Local • Regional • Global 	<ul style="list-style-type: none"> • Global for 1st tier • Regional or local for 2nd, 3rd tiers 	<ul style="list-style-type: none"> • Global 	<ul style="list-style-type: none"> • Global
<i>Critical capabilities</i>	<ul style="list-style-type: none"> • Material science • Process engineering 	<ul style="list-style-type: none"> • Research, design and process engineering • Manufacturing capabilities in varied technologies • Brand image 	<ul style="list-style-type: none"> • Research, design and engineering • Assembly and supply chain management capabilities 	<ul style="list-style-type: none"> • Product design and engineering • Assembly and supply chain management capabilities
<i>Types of components or systems</i>	<ul style="list-style-type: none"> • Steel blanks • Aluminium ingots • Polymer pellets 	<ul style="list-style-type: none"> • Stampings • Injection moulding • Engine components 	<ul style="list-style-type: none"> • Tyres • ABS • Elect. control unit 	<ul style="list-style-type: none"> • Interiors • Doors • Chassis

Figure 3. Segmentation of supplier roles in the automotive industry [24]

Procurement is very crucial in the automotive industry since an automotive consists of approximately 15,000 components [27]. Automotive OEMs prefer to outsource their non-core processes to suppliers in order to be more responsive and to be influenced less from demand fluctuations [28].

Supply strategy of the OEM provides a competitive advantage to their supplier and diffusion of lean production also influenced supply activities of automobile firm.

Supply chain of automobile industry has following challenges, these are:

- The complexity of the products: Each product has its own specifications in terms of engine, body, trim colour etc.
- The complexity of the supply network: Supply network consists of different stocking locations and several hundred dealers
- Consumer behaviour: New cars are made to order and customers compromise on specifications
- Demand seasonality: Varies between markets and affects the manufacturers.

6. Conclusion:

Manufacturers are under intense pressure to reduce production cost, elimination of waste, enhance high quality of product, increase the productivity, and better customer satisfaction. These parameters are usually achieved through the implementation of lean management practices in-house as well as at supplier level.

Companies are trying to increase their values through:

1. Increase in Quality
2. Decrease in Cost
3. Sustaining quality and long term commitment
4. Timeliness

It can be said that quality, cost and delivery are also very important in the automotive industry as they are in other sectors.

- Quality is the main concern of automotive manufacturers while supplying systems and parts
- Every company has its own standards for quality issues and suppliers must meet these standards
- Quality must be demonstrated by ISO certifications
- Secondly, even though cost has lost its importance over years in procurement, it is still considered highly important mainly because of strong competition among firms.
- Thirdly, continuity refers to being continuous of quality, processes and relationship. Continuity provides long term cost efficiency to the companies.
- Finally, timeliness is also important for smooth processes inside plants
- When it comes to lean manufacturing, lean principles are important for automotive assemblers. They have some lean requirements from suppliers for a better production.

- Long term relationship with close collaboration is also considered important.

Therefore, it can be concluded that the automobile industry needs to give more attention to implement lean management in all the key areas in-house and at supplier level. Hence, appropriate lean education, training, and research setup in association with manufacturing industries are to stimulate the lean awareness and technological development in all type of manufacturing industries. This helps to industries and researchers create awareness about Lean Managements Tools, and techniques to their supplier/vendor also.

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